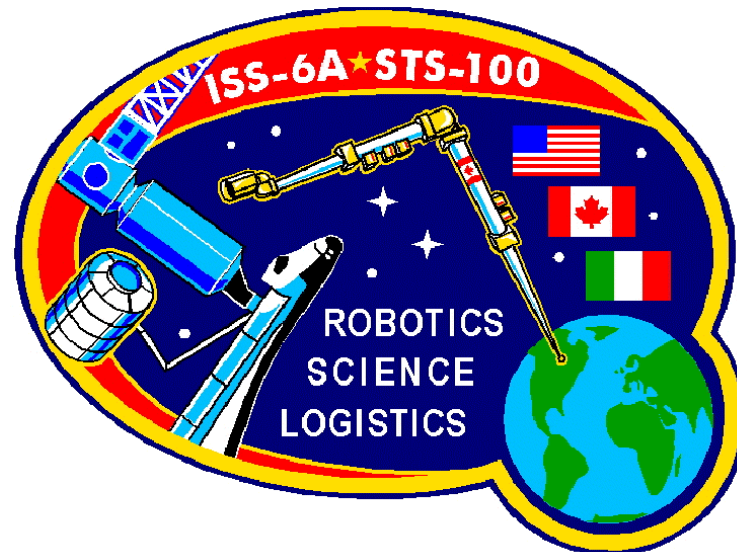


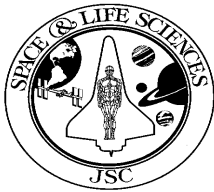
**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

ISS 6A/STS-100 Flight Readiness Review Space and Life Sciences Directorate





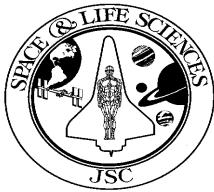
**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

STS-100/ISS-6A Space and Life Sciences Activities

- **Crew Health**
- **DSO's**
- **Open Items and In-flight Anomalies**
- **Radiation and Dosimetry Support**
- **Increment 2 Status**
- **Readiness Statement**



**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

Crew Health

- **All Crew Physicals will be completed prior to flight**
 - **Applicable flight rules are in place**

US Crew Surgeon

Rainer Effenhauser, M.D.

US Deputy Flight Surgeon

Roger Billica, M.D.

CSA Flight Surgeon

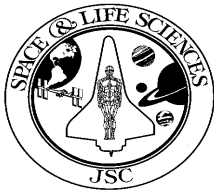
Jean-Marc Comtois, M.D.

ESA Flight Surgeon

Filippo Castrucci, M.D.

RSA Flight Surgeon

Alexander Kulev, M.D.



**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

DSO's

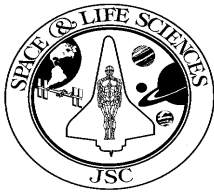
- **The following SLSD DSO's have been manifested or scheduled for ISS 6A/STS-100:**

DSO 493 – Monitoring Latent Virus Reactivation and Shedding in Astronauts

DSO 496 - Individual Susceptibility to Post-Spaceflight Orthostatic Intolerance (pre/postflight only)

DSO 498 - Spaceflight and Immune Function (pre/postflight only)

DSO 499 - Eye Movements and Motion Perception Induced by Off-Vertical Axis Rotation (OVAR) at Small Angles of Tilt after Spaceflight (pre/post flight only)



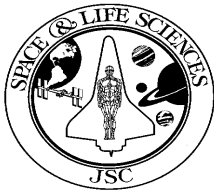
**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

Open Items and Inflight Anomalies (IFA's)

- **All remaining open work is planned and scheduled**
- **No open SSP IFA's or constraints**



**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

RADIATION ANALYSIS & DOSIMETRY SUPPORT

• **STS-100 FLIGHT SPECIFIC**

- Nominal mission (10 d 19 h 33 m) crew exposure projection
(AP-8 SOLMAX MODEL/USGS70(EPOCH 70)/ 1.8 scale factor & GCR Model
8.30 mrad/d; Q=2.96])

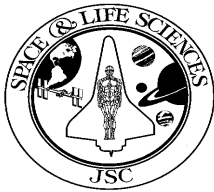
192 mrad (395 mrem)

- **Daily Average Exposure:** 19 mrad/day (38 mrem/day)
- **Day 1:** 9.16 mrad/day (25.7 mrem/day)
- **Day 2:** 13.8 mrad/day (31.5 mrem/day)
- **Days 3-11:** 19 mrad/day (38 mrem/day)

**Shuttle Exposure History
(through STS-100)**

Max: 4310 mrad
Min: 5.6 mrad
Avg: 252 mrad
Median: 129 mrad

- Onboard Radioactivity (experiment name (# sources) – isotope – activity)
 - » Fire detectors (all flights) -- orbiter (9) -- Am-241 → 6.12 μ Ci
 - » Operational TEPC (1) -- Cs-244 → 1.0 μ Ci
 - » MAMS (1) – Ra-226 → 0.8 μ Ci
- Radiation related experiments/payloads on this flight
 - » Additional Personal Radiation Protection System (PRPS) “bricks” (on “space-available” basis)



**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

RADIATION ANALYSIS & DOSIMETRY SUPPORT cont.

- **EVA EXPOSURES (additional skin exposure)**
 - **Additional exposure due to protons in SAA and electrons in outer electron belt**
 - **EVA1 (start MET 002/17:25)**

▪ Nominal - 1 hr early start	20 mrad/20 mrem
▪ Nominal	20 mrad/20 mrem
▪ Nominal + 1 hr late start	20 mrad/20 mrem
▪ Nominal + 2 hr late start	60 mrad/60 mrem
 - **EVA2 (start MET 004/17:25)**

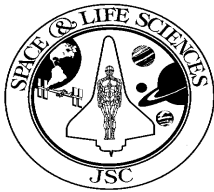
▪ Nominal - 1 hr early start	05 mrad/10 mrem
▪ Nominal	40 mrad/40 mrem
▪ Nominal + 1 hr late start	50 mrad/50 mrem
▪ Nominal + 2 hr late start	80 mrad/80 mrem

CONTINGENCY EVA EXPOSURES (additional skin exposure)

- **Worst case 6.5 EVA additional skin exposures:**
 - 4 hr 340 mrad / 430 mrem
 - 6.5 hr 450 mrad/ 540 mrem

NOMINAL IVA EXPOSURES

- **Daily 20 mrad / 40 mrem**



**Space and Life Sciences Directorate
Flight Readiness Review
STS-100/ISS-6A**

D. R. Williams

Date: April 5, 2001

Increment 2 Status

Treadmill Vibration Isolation System (TVIS)

- TVIS Operation: presently inoperable due to broken tread slats.
- Plan to deliver hardware on 6A to replace all slats on treadmill.
- Large timeline impact for Increment 2 for slat replacement IFM.

Interim Resistive Exercise Device (IRED)

- Currently operational. New canisters on 6A.

Radiation exposure for Increment 2 (124 day nominal mission)

- 1860 mrad/ 3720 mrem (3.72 rem)
- Daily Average Exposure 15 mrad/day (35 mrem/day)
- Additional Personal Radiation Protection System items on 6A (13 flat bricks, 6 corners)

Russian Water System

- Levels of Cadmium detected in water on January 10 were above recommended levels.
- Initial sample showed 36 micrograms/liter.
- 7-14 micrograms per liter detected after flushing system. Long term exposure limits are 5 micrograms/liter.
- Crew instructed not to drink water from SVO-ZV port (cold water port).
- Source of contamination is a valve spring in the system.
- Russians working to resolve. Will replace valve or bypass valve. Can use hot water side.
- Additional water samples will be returned on 6A.

Contingency Exercise Plan for Expedition 2

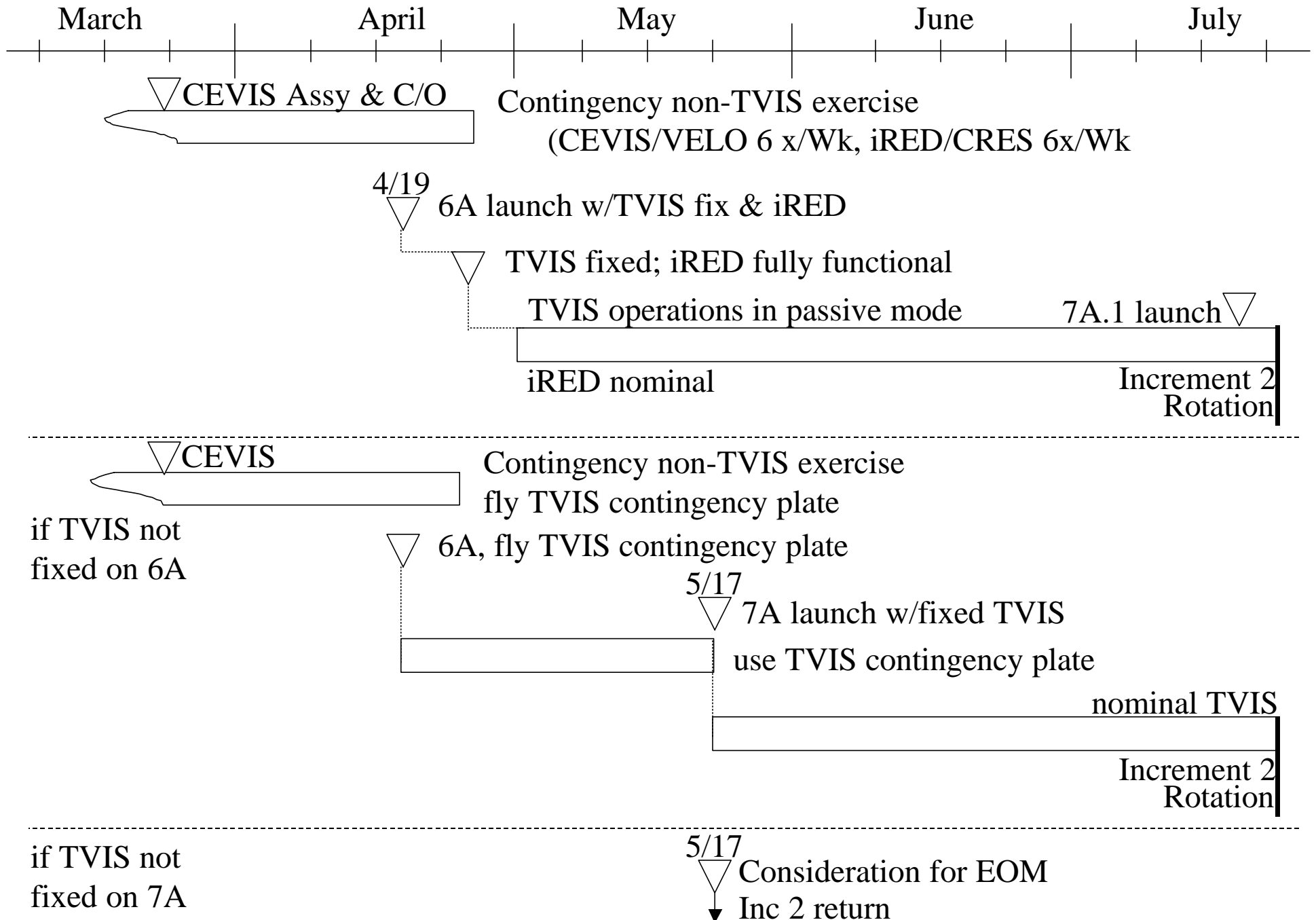
- **Exercise Requirements for TVIS**
 - **SSP 50261, Generic Groundrules and Constraints, section 4.3.1.41 (ref. CR 5262) specifies that..**
 - **“complete failure of single exercise hardware use (eg TVIS) use... will result in consideration of mission termination within 60 days”**
- **TVIS provides the following exercise benefits**
 - **Cardiovascular (Aerobic) Exercise**
 - **Ambulation (neuromuscular patterning)**
 - **TVIS unique capability – extensive Russian experience suggests this is critical to post flight crew health, safety, and performance**
 - **Axial skeletal loading (heel strike, etc.)**
 - **TVIS unique capability**
 - **Endurance exercise of anti-gravity musculature**

Contingency Exercise Plan for Expedition 2

- **Mitigation Strategy for Expedition 2**
 - **Loss of TVIS can be accommodated for an interim period using a combination of CEVIS, iRED and TVIS contingency exercises**
 - **Cycle/iRED thru 6A**
 - **TVIS functionality planned to be restored post-6A**
 - **Russian data suggests passive TVIS ops may extend slat life by reducing imparted forces**
 - **If TVIS functionality not secured, Cycle/iRED/TVIS contingency plate 6A-7A**
 - **Full TVIS functionality required by 7A or mission termination must be considered**

* Unique TVIS capability

EXPEDITION 2 EXERCISE PLAN



Certification of Flight Readiness 2 Statement

The activities required to support Flight 6A/STS-100, 4 Progress, 2 Soyuz have been accomplished except open work identified (attachment 1). The Space and Life Sciences Directorate is in support Flight 6A/STS-100, 4P, 2S.

There are no constraints to proceeding with the planned Flight 6A/STS-100, 4P, 2S pending completion of scheduled open work.



W. A. Langdoc, Chief
Flight Projects Division



J. L. Robinson, Ph.D., Chief
Program Integration Office



G. J. Byrne, Earth Science &
Exploration Division



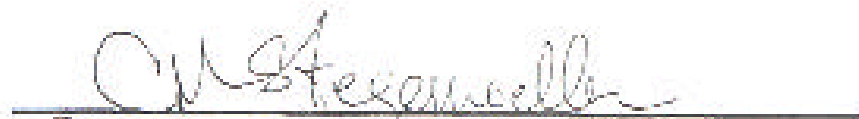
C. L. Fischer, M.D., Chief,
Medical Operations



C. M. Stegemoeller, Manager,
Human Space & Life Sciences
Program Office



M. L. Richardson, Chief,
Mission and Project Management
Office



David R. Williams, M.D., Director
Space and Life Sciences Directorate